

GLOSSARY

Alcohol: A general class of hydrocarbons that contain a hydroxyl group (OH). The term “alcohol” is often used interchangeably with the term “ethanol,” even though there are many types of alcohol.

Alternative fuels: Fuels or energy sources that can replace petroleum-based liquid fuels, particularly for transportation purposes. Examples include biofuels, coal-to-liquid fuels, compressed natural gas, and hybrid (gas/electric) vehicles.

Alternative transportation fuels standard: Governmental requirements that establish goals for ensuring that specified volumes of alternative fuels or technologies are sold or introduced into commerce annually to reduce the dependence on foreign oil and the production of greenhouse gases.

Anaerobic digestion: A biochemical process by which organic matter is decomposed by bacteria in the absence of oxygen, producing methane and other byproducts.

Avoided costs: An investment guideline describing the value of a conservation or generation resource investment by the cost of more expensive resources that a utility would otherwise have to acquire.

Biodiesel: A biofuel produced through transesterification, a process in which organically-derived oils are combined with alcohol (ethanol or methanol) in the presence of a catalyst to form ethyl or methyl ester. The biomass-derived ethyl or methyl esters can be blended with conventional diesel fuel or used as a neat fuel (100 percent biodiesel). Biodiesel can be made from soybean or rapeseed oils, animal fats, waste vegetable oils or microalgae oils.

Biomass: Renewable organic matter such as agricultural crops and residue, wood and wood waste, animal waste, aquatic plants and organic components of municipal and industrial wastes.

Biomass fuel: Liquid, solid or gaseous fuel produced by conversion of biomass.

British thermal unit: (Btu) A unit of heat energy equal to the heat needed to raise the temperature of one pound of water one degree Fahrenheit at one atmosphere pressure (sea level).

Carbon dioxide: A naturally occurring gas, and also a byproduct of burning fossil fuels and biomass, as well as land-use changes and other industrial processes. It is the principal anthropogenic greenhouse gas that affects the earth's radiative balance. It is the reference gas against which other greenhouse gases are measured and therefore has a Global Warming Potential (GWP) of 1.

Carbon sequestration: The uptake and storage of carbon.

Cellulose: The main carbohydrate in living plants. Cellulose forms the skeletal structure of the plant cell wall.

Cellulosic biofuels: Liquid fuels and blending components produced from cellulose biomass feedstocks, used primarily for transportation (modified from http://www.eia.doe.gov/glossary/glossary_b.htm). Cellulosic feedstocks can be derived from harvested crops, crop residue, or municipal solid waste; cellulosic molecular chains in the biomass are chemically broken with acids or enzymes, making sugar molecules available for bacterial fermentation and ethanol production.

Clean Coal Technology (CCT) program: The CCT program refers to a number of technological advances that make the burning process of coal cleaner by removing pollutants such as sulfur, nitrogen, and fly ash that can contaminate the air and water.

Climate change: Climate change refers to any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer). Climate change may result from:

- Natural factors, such as changes in the sun's intensity or slow changes in the earth's orbit around the sun.
- Natural processes within the climate system (e.g. changes in ocean circulation).
- Human activities that change the atmosphere's composition (e.g., through burning fossil fuels) and the land surface (e.g., deforestation, reforestation, urbanization, desertification, etc.).

Coal gasification: Coal gasification is the process that changes coal into a gas.

Coal-to-gas: Also known as coal gasification, is the process of converting coal into gas. The basic process involves crushing coal to a powder, which is then heated in the presence of steam and oxygen to produce a gas. The gas is then refined to reduce sulfur and other impurities. The gas can be used as a fuel or processed further and concentrated into chemical or liquid fuel. (http://www.eia.doe.gov/glossary/glossary_c.htm)

Coal-to-liquid: Liquid fuels produced from gasification of coal including dimethyl ether, methanol or synthetic diesel.

Cogeneration: The sequential production of electricity and useful thermal energy from a common fuel source. Rejected heat from industrial processes can be used to power an electric generator (bottoming cycle). Conversely, surplus heat from an electric generating plant can be used for industrial processes, or space and water heating purposes (topping cycle).

Combined cycle: Two or more generation processes in series or in parallel, configured to optimize the energy output of the system.

Combined-cycle system: In a combined-cycle system, gas from heating coal operates a combustion turbine connected to a generator, and the exhaust gases from this turbine heat water that, in turn, operates a steam-powered generator.

Conservation: To reduce or avoid the consumption of a resource (energy) or commodity.

Earth-Coupled Ground Source (Geothermal) Heat Pump: A type of heat pump that uses sealed horizontal or vertical pipes, buried in the ground, as heat exchangers through which a fluid is circulated to transfer heat either from the ground (winter) or into the ground (summer).

Efficiency: The ratio of desired work-type output to the necessary energy input, in any given energy transformation device. An efficient LIGHT bulb for example uses most of the input electrical energy to produce light, not heat. An efficient HEAT bulb uses most of its input to produce heat, not light.

Energy conservation: To reduce or avoid the consumption of a resource or commodity.

Energy crops: Crops grown specifically for their fuel value. These include food crops such as corn and sugarcane and nonfood crops such as poplar trees and switchgrass. Currently, two energy crops are under development in the United States: short-rotation woody crops, which are fast-growing hardwood trees harvested in five to eight years, and herbaceous energy crops, such as perennial grasses, which are harvested annually after taking two to three years to reach full productivity.

Energy efficiency: Energy efficiency refers to products or systems using less energy to do the same or better job than conventional products or systems.

Energy Efficiency Resource Standard (EERS): A market-based mechanism to encourage more efficient generation, transmission, and use of electricity and natural gas by setting electric and/or gas energy savings targets or goals for utilities.

ENERGY STAR: ENERGY STAR is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy helping businesses and individuals save money and protect the environment through energy efficient products and practices.

Ethanol: Ethyl alcohol produced by fermentation and distillation. An alcohol compound with the chemical formula $\text{CH}_3\text{CH}_2\text{OH}$ formed during sugar fermentation by yeast.

Feedstock: Raw material supplied to a machine or processing plant from which other products can be made. In the case of biofuels, the feedstock is the raw biological material, or biomass, used to produce the biofuels.

Fischer-Tropsch Fuels: Liquid hydrocarbon fuels produced by a process that combines carbon monoxide and hydrogen. The process is used to convert coal, natural gas and low-value refinery products into a high-value diesel substitute fuel.

Flexible-fuel vehicle: A vehicle with a single fuel tank designed to run on varying blends of unleaded gasoline with either ethanol or methanol.

Fluidized-bed combustion (FBC): FBC is a process of burning coal in which the coal is inserted in a bed of particles that are suspended in the air and that react with the coal to heat the furnace more cleanly. In FBC, coal is burned at a slightly lower temperature, which helps prevent some nitrogen oxide gases from forming.

Gasifier: A device for converting solid fuel into gaseous fuel. In biomass systems, the process is also referred to as pyrolytic distillation. See pyrolysis.

Gasification: A chemical or heat process to convert a solid fuel to a gaseous form.

Gasohol: A motor vehicle fuel which is a blend of 90 percent unleaded gasoline with 10 percent ethanol (by volume). This term was used in the late 1970s.

Generator: A machine used for converting rotating mechanical energy to electrical energy.

Geothermal: Pertaining to heat energy extracted from reservoirs in the earth's interior, as in the use of geysers.

Greenhouse effect: The trapping of the sun's radiant energy, so that it cannot be reradiated back into space. In cars and buildings the radiant energy is trapped by glass; in the earth's atmosphere the radiant energy is trapped by gases such as chlorofluorocarbons (CFCs) and carbon dioxide.

Greenhouse gases: Gases that trap the heat of the sun in the Earth's atmosphere, producing the greenhouse effect. The two major greenhouse gases are water vapor and carbon dioxide. Other greenhouse gases include methane, ozone, chlorofluorocarbons, and nitrous oxide.

Grid: An electric utilities industries system for distributing power.

Grid connection: Joining a facility that generates electric power to a utility system so that electricity can flow in either direction between the utility system and the facility.

Hybrid Gasoline-Electric Vehicle (HEV): A hybrid vehicle which combines a conventional gasoline propulsion system with a rechargeable energy storage system to achieve better fuel economy than a conventional vehicle.

Hybrid vehicle: Usually a hybrid electric vehicle (EV), a vehicle that employs a combustion engine system together with an electric propulsion system. Hybrid technologies expand the usable range of EVs beyond what an all-electric-vehicle can achieve with batteries only.

Integrated Resource Planning (IRP): A plan developed by an electric power provider, sometimes as required by a public regulatory commission or agency, that defines the short and long term capacity additions (supply side) and demand side management programs that it will undertake to meet projected energy demands.

Investment tax credit: A specified percentage of the dollar amount of certain new investments that a company can deduct as a credit against its income tax bill.

Investor-owned utility: (IOU) A private power company owned by and responsible to its shareholders.

Kilowatt: (kW) A measure of electrical power equal to 1,000 Watts. $1 \text{ kW} = 3,413 \text{ Btu/hr} = 1.341 \text{ horsepower}$.

Kilowatt hour: (kWh) A measure of energy equivalent to the expenditure of one kilowatt for one hour. For example, 1 kWh will light a 100-watt light bulb for 10 hours. $1 \text{ kWh} = 3,413 \text{ Btu}$.

Landfill gas: Gas that is generated by decomposition of organic material at landfill disposal sites. Landfill gas is approximately 50 percent methane.

Life-cycle costing: A method of comparing costs of equipment or buildings based on original costs plus all operating and maintenance costs over the useful life of the equipment. Future costs are discounted.

Load factor: Load factor is the ratio of average demand to maximum demand or to capacity.

Megawatt: (MW) The electrical unit of power that equals one million Watts (1,000 kW).

Megawatt Hour (MWh): One-thousand kilowatt-hours.

Methane: An odorless, colorless, flammable gas with the formula CH_4 that is the primary constituent of natural gas.

Mil: One-tenth of one cent \$0.001.

Nuclear Regulatory Commission (NRC): An independent federal agency that ensures that strict standards of public health and safety, environmental quality and national security are adhered to by individuals and organizations possessing and using radioactive materials. The NRC is the agency that is mandated with licensing and regulating nuclear power plants in the United States. It was formally established in 1975 after its predecessor, the Atomic Energy Commission, was abolished.

Peak load or Peak demand: The highest electrical demand within a particular period of time. Daily electric peaks on weekdays occur in late afternoon and early evening. Annual peaks occur on hot summer days.

Peak Load Power Plant: A power generating station that is normally used to produce extra electricity during peak load times.

Peaking unit: A power generator used by a utility to produce extra electricity during peak load times.

Plug-In Hybrid Electric Vehicle (PHEV): A hybrid electric vehicle (HEV) which combines a conventional propulsion system with a rechargeable energy storage system that can be recharged by connecting a plug to an electric power source.

Photovoltaic: A system that converts direct sunlight to electricity using semi-conductor materials.

Public Benefit Fund (PBF): Funds collected either through a small charge on the bill of every customer or through specified contributions from electric and/or natural gas utilities that can be used to support renewable energy, energy efficiency, low-income customer programs, or energy R&D programs.

Pyrolysis: The thermal decomposition of biomass at high temperatures (greater than 400 degrees Fahrenheit, or 200 degrees Celsius) in the absence of air. Also called destructive distillation. The end product of pyrolysis is a mixture of solids (char), liquids (oxygenated oils), and gases (methane, carbon monoxide, and carbon dioxide) with proportions determined by operating temperature, pressure, oxygen content, and other conditions.

Quad: One quadrillion Btu (10¹⁵ Btu). An energy equivalent to approximately 172 million barrels of oil.

Renewable and Efficiency Portfolio Standard (REPS): A mandate or goal requiring that a certain percentage of overall energy demand be derived from a combination of energy efficiency, renewable energy and biofuels.

Renewable fuels: Fuels produced from renewable resources, such as biofuels (e.g. vegetable oil used as fuel, ethanol, or biodiesel). This is in contrast to non-renewable fuels such as natural gas, LPG (propane) and other fossil fuels.

Renewable fuels standard: Governmental requirements that establish goals for ensuring that applicable volumes of renewable fuels are sold or introduced into commerce annually. The Energy Independence and Security Act of 2007 (H.R. 6), for example, applies to refiners, blenders and importers and sets forth a phase-in for renewable fuel production volumes beginning with 9 billion gallons in 2008 and ending at 36 billion gallons in 2022.

Renewable Portfolio Standard (RPS): A mandate or goal requiring that a certain percentage of electricity come from renewable sources of energy (e.g. solar, wind, hydro, etc.).

Smart Grid: An electricity transmission and distribution network or “grid” that uses robust two-way communications, distributed computers, and advanced sensors and switches to significantly improve the efficiency, reliability and safety of power delivery and use.

Sustainable: An ecosystem condition in which biodiversity, renewability, and resource productivity are maintained over time.

Syngas: A synthesis gas produced through gasification of biomass. Syngas is similar to natural gas and can be cleaned and conditioned to form a feedstock for production of methanol.

Tariff: A document, approved by the responsible regulatory agency, listing the terms and conditions, including a schedule of prices, under which utility services will be provided.

Transportation Demand Management (TDM): The application of strategies and policies to reduce automobile and truck transport travel demand, or to redistribute this demand in space or in time.

Watt: The common base unit of power in the metric system. One watt equals one joule per second. It is the power developed in a circuit by a current of one ampere flowing through a potential difference of one volt. One Watt = 3.413 Btu/hr.

Wheeling: The process of transferring electrical energy between buyer and seller by way of an intermediate utility or utilities.

<http://www.teachcoal.org/glossary.html>

<http://www.energy.ca.gov/glossary/glossary-xyz.html>

<http://www.oregon.gov/ENERGY/RENEW/glossary.shtml>

<http://www.epa.gov/solar/energy-and-you/glossary.html>

ENERGY TERMS

The basic unit of heat energy is the **British Thermal Unit**, Btu, the amount of heat necessary to raise a pound of water a degree Fahrenheit.

Mcf - Thousand Cubic Feet: One thousand cubic feet. One mcf equals the heating value of 1,000,000 Btu (mmbtu).

Electric power is measured in **watts**, where a watt = 3.412 Btu.

Electric energy is measured in **watt hours**. It is also expressed in kilowatt hours (kWh) = a thousand watt hours, megawatt hours (MWh) = a million watt hours, gigawatt hours (GWh) = a billion watt hours, and terrawatt hours (TWh) = a trillion watt hours.

The table below expresses some relationships between forms of energy:

Fuel	Unit	Btu/Unit	Cost/ Unit	Cost/MBtu
Coal	Ton	28,000,000	\$105	\$ 3.75
Crude Oil	Barrel	6,300,000	\$120	\$ 19.05
Heating Oil	Gallon	140,000	\$3.00	\$ 21.43
Propane	Gallon	92,000	\$2.50	\$ 27.17
Gasoline	Gallon	125,000	\$3.60	\$ 28.80
Natural Gas	Mcf	1,000,000	\$10.50	\$ 10.50
Electricity	kWh	3,412	\$0.07	\$ 20.52

ENVIRONMENTAL TERMS

A short ton is defined as 2000 pounds; a metric ton is 1000 kilograms = 2204 pounds.

CO₂, carbon dioxide, is the most predominant greenhouse gas

NO_x, oxides of nitrogen, are produced by the burning of fossil fuels

SO_x, oxides of sulfur, are produced by burning sulfur-bearing fossil fuels

<http://www.coloradoefficiencyguide.com/glossary/default.htm>

ACRONYMS

A

AEO - Annual Energy Outlook, DOE/EIA publication
ANSI - American National Standards Institute
API - American Petroleum Institute
APPA - American Public Power Association
ASHRAE - American Society of Heating Refrigeration & Air Conditioning Engineers
ASME - American Society of Mechanical Engineers

B

BAU - Business as usual
bbl - barrel
BBLs - barrels of oil
BCF - billion cubic feet
Bcfd - billion cubic feet per day
BTL - Biomass-to-liquid
Btu - British thermal unit

C

CAA - U.S. Clean Air Act
CAFE - Corporate Average Fuel Economy
CFB - circulating fluidized bed
CFCs - chloro-fluorocarbons
CFM - cubic feet per minute
CNG - Compressed natural gas
CO - carbon monoxide
CO₂ or CO₂ - Carbon dioxide
COL - Combined construction and operating license
CT - combustion turbine
CTG - combustion turbine generator
CTG - Coal-to-gas conversion
CTL - Coal-to-liquid conversion

D

DOE - U.S. Department of Energy
DSM - Demand Side Management

E

EIA - Energy Information Administration, division of U.S. Department of Energy
EOR - Enhanced oil recovery
EPA - U.S. Environmental Protection Agency

F

FERC - Federal Energy Regulatory Commission
FT - Fischer-Tropsch process of converting methane, biomass, or coal to liquid fuels

G

GHG - Greenhouse gas (e.g., CO₂, methane)

gpd - gallons per day

GTL - Gas-to-liquids conversion

GW - gigawatt

GWh - gigawatt-hour

H

HVAC - Heating Ventilation and Air Conditioning

I

IEA - International Energy Agency

IRP - Integrated Resource Planning

IOU - Investor-owned Utility

K

KGS - Kentucky Geological Survey

KRS - Kentucky Revised Statutes

kW (small k, capital W) - kilowatt

kWe - kilowatt, electric

kWh - kilowatt hour

kWp - peak kilowatt

L

LBNL - Lawrence Berkeley National Laboratory

lbs - pounds

LEU - Low enriched uranium

LNG - liquefied natural gas

M

MCF - thousand cubic feet

MW - megawatt (million watts)

MWh - megawatt hour

N

NETL- National Energy Technology Laboratory

NO - nitrogen oxide

NO₂ - nitrogen dioxide

NRC - Nuclear Regulatory Commission

NRDC - Natural Resources Defense Council

NREL - National Renewable Energy Laboratory, a laboratory of the U.S. Department of Energy

NSR - New Source Review

O

OPEC - Organization of Petroleum Exporting Countries

ORNL - Oak Ridge National Laboratory

P

PHEV- Plug-in Hybrid Electric Vehicle

PM - particulate matter

PM10 - particulate matter 10 microns and smaller in diameter

PM2.5 - particulate matter 2.5 microns and smaller in diameter

PV - photovoltaic

Q

Quad - one quadrillion (10^{15}) British thermal units

R

RTO - Regional Transmission Organization

RTP - real-time pricing

S

SNG - Synthetic Natural Gas

SO₂ - sulfur dioxide

SO₄ - sulfates

SO_x - sulfur oxides

T

TBtu - trillion Btu

TCF - trillion cubic feet

TCF - Trillion cubic feet (dry natural gas)

U

U.S. DOE - United States Department of Energy

USCOE - U.S. Corps of Engineers

USGS - United States Geological Survey

V

VOC - volatile organic compounds

W

W - Watt

<http://www.energy.ca.gov/glossary/acronyms.html>